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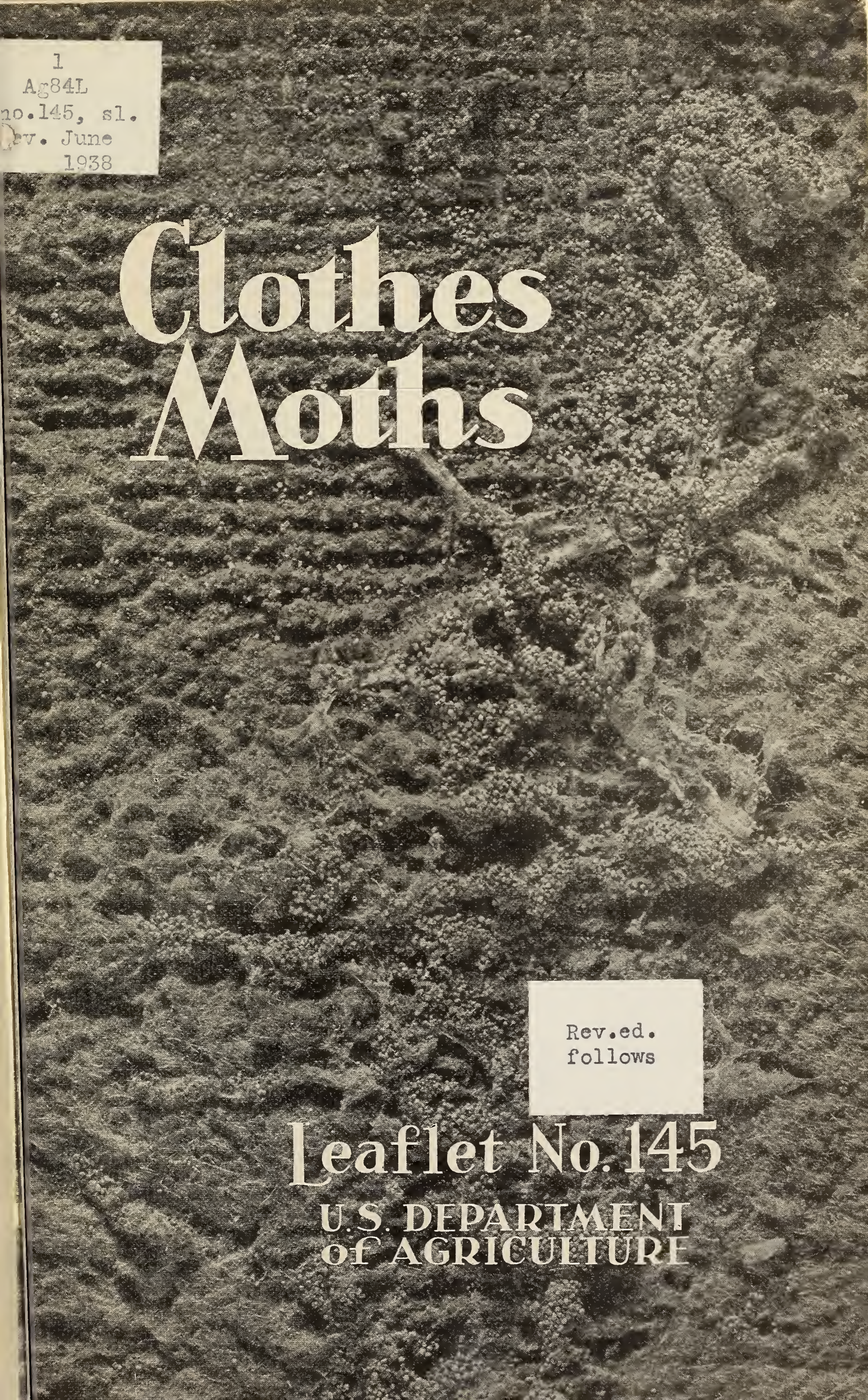

Clothes Moths

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CLOTHES MOTHS

By E. A. Back, *principal entomologist, Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine*

Clothes moths are found in nearly all dwellings, regardless of the location. Their abundance is influenced by the temperature and humidity maintained in the house, the type of house construction and furnishings, and the thoroughness of the house cleaning. They are exceedingly destructive, particularly from an aesthetic standpoint, and the damages and expenditures for their control amount to many millions of dollars annually.

Description, Development, and Food

The clothes moths that are ordinarily troublesome are very small and have a wing spread of about half an inch. The webbing clothes moth (*Tineola bisselliella* Hum.) (fig. 1) is uniformly yellowish or buff-colored; the case-bearing clothes moth (*Tinea pellionella* L.) (fig. 2, *A*) is similar in color but has indistinct dark spots on the wings.

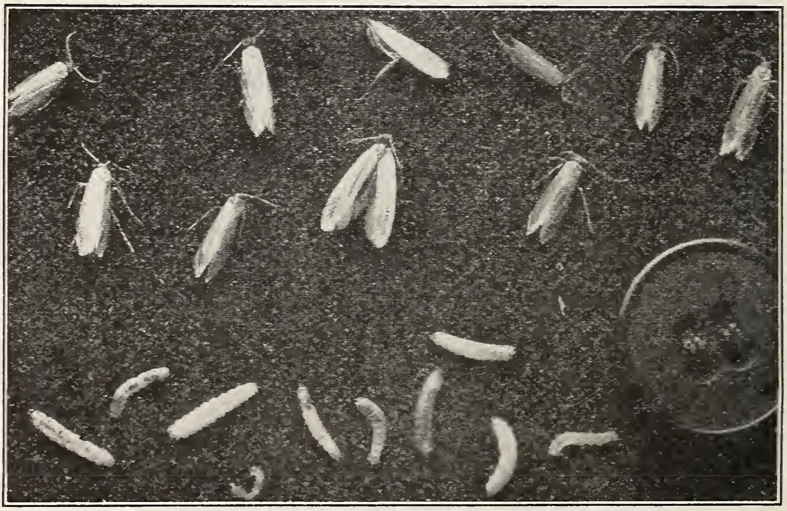

Figure 1.—Ten adult webbing clothes moths and 10 worms or larvae, photographed on a vest. About 1¾ times natural size.

The moths fly lazily in darkened corners, or just beyond the range of the brightest rays of the lamp. They prefer darkness. They do not flit about lights. When clothing and other objects are suddenly moved the moths can often be seen running rapidly or flying to conceal themselves in folds of clothing, cracks, or other dark places. The parent moth does not eat clothing. Moths usually live not more than

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2 weeks, seldom 4 weeks. It is said that moths never fly unless all their eggs have been laid; this has been proved untrue.

Moths lay from 100 to 300 soft, white eggs (fig. 3, *A*). These eggs should not be confused with the hard, gritty, variously colored pellets of larval excrement (fig. 3, *B*), which are often abundant on moth-eaten fabrics. The eggs are deposited in the nap of clothing, in the pile of furniture upholstering, in cracks, and elsewhere, but are not fastened to the surface upon which they are laid. They hatch in from 4 to 8 days in summer, and in from 3 to 4 weeks in colder weather. Eggs never lie dormant during the winter months, to hatch on the return of warm weather.

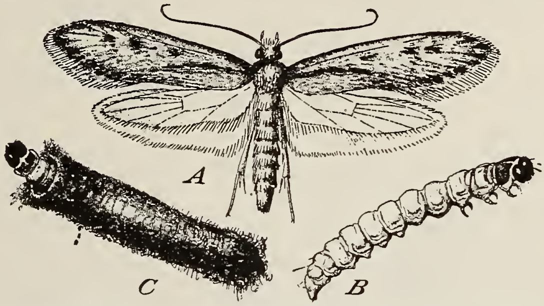

FIGURE 2.—The case-bearing clothes moth: *A*, Adult moth; *B*, larva; *C*, larva partially concealed in its portable case. The indistinct dark spots on the buff-colored forewings distinguish the adult of the case-bearing clothes moth from that of the webbing clothes moth, the wings of which are uniformly buff-colored. All five times natural size.

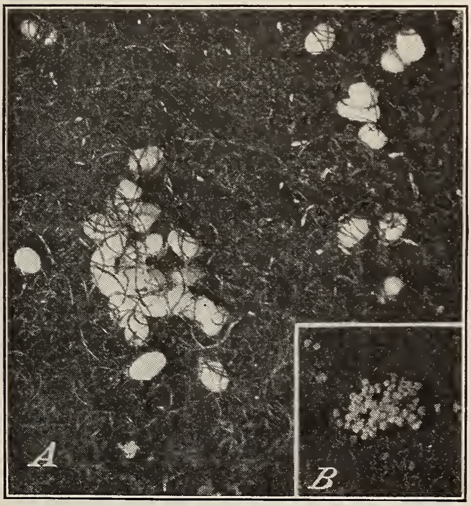

FIGURE 3.—The webbing clothes moth: *A*, White eggs laid in the nap of cloth or on the surface; *B*, pellets of larval frass, which usually are colored according to the color of the material upon which the larva has been feeding.

The newly hatched worm, or larva, crawls readily. Once on its food, it starts spinning a shelter of silken threads, in which it conceals itself. This shelter may be a tube of varying length attached to the surface (fig. 4, *a*) or built through the material (fig. 5) upon which the larva feeds, or it may be a portable case (fig. 2, *C*) which the larva drags about wherever it goes and into which it retreats, drawing shut the front and back doors when danger threatens. Full-grown larvae are white with a dark head, are about half an inch long (fig. 1; fig. 2, *B*), and transform to brown chrysalids or pupae before maturing to the parent moth or miller form.

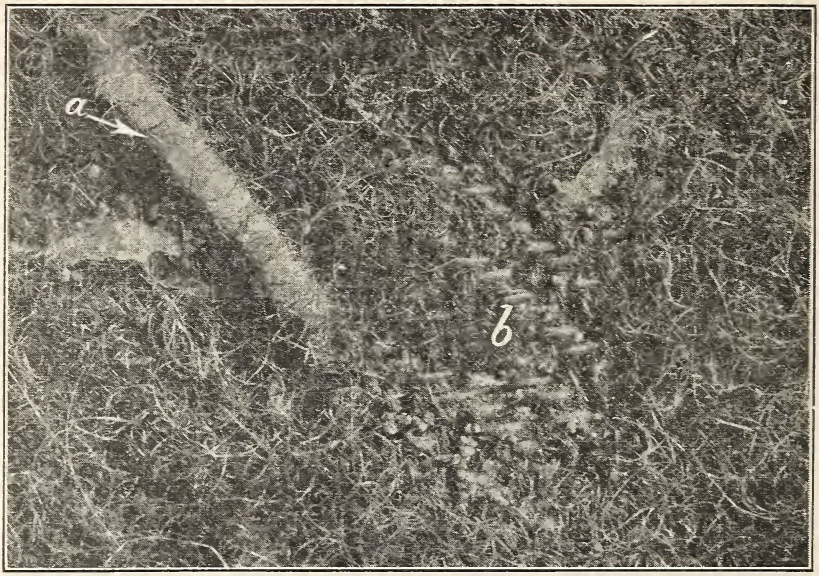

FIGURE 4.—The webbing clothes moth: *a*, Long, narrow feeding tube spun by the larva; *b*, place where nap has been eaten away to the warp by the larva now hidden in the silken tube. These tubes are of various lengths and are often branched; into their walls of silk the larva often weaves bits of the material upon which it is feeding.

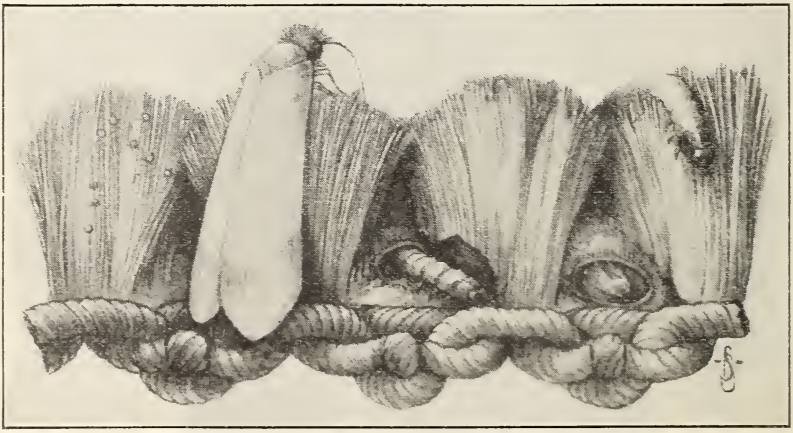

FIGURE 5.—View of edge of carpet, showing from left to right: Eggs of clothes moth on pile of first row; adult moth resting on second tuft; larva protruding from a tube constructed on the warp between the second and third tufts and feeding upon the pile of the third tuft; end of pupa in a cocoon built on the warp between the third and fourth tufts; and larva crawling down over the top of the fourth tuft. Diagrammatic and greatly enlarged.

Clothes moths require from about 50 days to 3 years to complete their development; that is, through the egg, larval, and pupal stages. Most of this time is spent in the destructive larval stage.

Clothes moths feed upon animal substances such as wool, hair, fur, feathers, and a wide range of commodities manufactured from these materials. Housewives often overlook the fact that woolen lint and hair accumulating in floor cracks, under the quarter round and baseboard, and in other not easily accessible places are often fertile breeding grounds. Dog and cat hairs accumulating in basements may yield a supply of moths. Moths seem unable to mature on some dyed fabrics, but as yet no dye appears to be capable of imparting a trustworthy protection against moths. If clothes moths matured as well upon all suitings and dress goods as they do upon raw animal products, such as undyed fur, casein, fish meal, dead insects, etc., man would find the fight against them far more difficult than now, when he benefits from a natural mortality among moth larvae of from 90 to 99 percent on much of his clothing.

Control

Moth control is complicated because the fight has many fronts. Judgment must be exercised in selecting a method of control suited to the need. When an entire house is overrun with moths, drastic control measures in the form of fumigation or spraying may be necessary, but more often local treatments, supplemented with ordinary house cleaning, will be sufficient. (Most of the practices recommended for controlling clothes moths are also helpful in the destruction of carpet beetles and certain other household pests.)

Fumigation of the entire house.—Most fumigants that are effective for the entire house, such as hydrocyanic acid gas and chloropicrin, are dangerous to human life; hence fumigation should be turned over to experienced persons, who should be made to assume all the responsibility and work under local health-department regulations if such exist. Fumigating the entire home is out of the question in some congested areas and in apartment houses. *No fumigation with a dangerous gas should be permitted in any part of a dwelling while other portions are occupied.* Exceptions can be made, in many instances, to permit the use of the modern fumigating mixtures of carbon dioxide with ethylene oxide, methyl formate, and methyl bromide, provided their use is carefully supervised by licensed pest-control operators working under health-department permits. Specific instructions should be obtained from the proper officials. Printed directions may be obtained from the United States Department of Agriculture.

Sprays.—Sprays available at stores under trade names usually consist largely of a high-grade, odorless, stainless kerosene oil plus pyrethrum or derris extracts. Directions for making a spray of this type are issued by this Department. These sprays are contact sprays, that is, they kill only the insects actually hit or made wet, and they do not render the sprayed objects immune to moth attack. They are used to destroy moths on clothing and furniture, in floor cracks, about baseboards, and elsewhere. They can be applied with hand sprayers, but are best applied with power sprayers. Many insect exterminators or pest-control operators have excellent power-spraying equipment for treating cracks that are inaccessible with the average hand sprayer.

Vaporizing machines, which merely fill the room with a fine mist, are of little practical value in moth control.

Mothproofing solutions.—There are on the market today a number of solutions which, when applied to clothing, rugs, drapes, furniture covers, etc., are said to make them immune to moth attack. No solution will absolutely and permanently mothproof fabrics, although certain ones, when applied in the hot dye bath during the manufacturing process, more nearly achieve this desired result. It would appear, however, that the better solutions now readily available impart a resistance to moths that is of very practical value when applied so that the treated fabric is thoroughly wet. Dry cleaning, washing, and exposure to light usually lessen in some degree, depending on the nature of the mothproofing solution used, the moth-resistant quality imparted by the original treatment. Aqueous fluoride solutions are readily removed by thorough washing in water, while solutions with a naphthalike base are equally well removed by dry-cleaning processes. The United States Department of Agriculture does not approve or recommend mothproofing solutions that depend for their effectiveness upon arsenic in any form or amount.

Dry cleaning.—Dry cleaning kills all forms of moths at the time of treatment, but does not impart moth resistance.

Washing.—Washing in a strong solution of neutral soap kills all moths but does not protect against reinfestation.

Wrapping in paper bundles.—Clothing just dry-cleaned or washed, if wrapped in paper with its edges well folded back or sealed carefully, will remain free from moths indefinitely if the paper is not broken. Sealing in unbroken hat boxes or other cardboard boxes will accomplish the same result. The addition of some flake naphthalene is advised, to destroy any moth which may have gained access to the clothing.

Cold storage.—Cold storage is excellent for the protection of furs, garments, rugs, or anything else, from moth injury.

Fumigable storage.—Fumigable commercial storage is excellent for the protection of furs, clothing, furniture, and other articles from moth injury.

Cold weather.—Clothes moth larvae are incapable of causing harm at 50° F. or below. They are killed within from 1 to 2 days by zero temperatures, and articles, such as clothing, rugs, and furniture, exposed to zero weather will be freed of moth life. Moth larvae have lived 67 days at 20° to 25° F., and 283 days at 30° to 35° F. In most parts of the country cold weather has little effect upon moths in buildings.

Heat.—All forms of moths are killed upon exposure for a short time to temperatures of 125° to 130° F. Newly hatched larvae die at 100° F. Where heat penetration is required, as in upholstered furniture, the interior itself, not the air about it, must be raised to 125° to 130° F. Where heating facilities are available, entire houses can be superheated during hot summer weather, and this can be effective not only in destroying clothes moths but other common house pests such as carpet beetles and bedbugs. About 12 hours is required to get the desired temperature everywhere in the house.

Sunning and brushing.—The soft eggs are easily crushed or dislodged by thorough brushing. Pay particular attention to all seams, pockets, etc. Moths cannot stand bright sun. Larvae drop to the ground from clothing left hanging in the sun on the line, especially if no folds are present in which they can find protection from the light rays.

Good housekeeping.—In combating clothes moths it is important to keep floors and rugs well vacuum-cleaned. Woolen garments kept in closets and not packed away for the summer should be frequently sunned and brushed, and care should be taken to keep all woolen materials off the floor. Woolen rags or discarded woolen clothing left carelessly about the house are often a source of serious moth infestations.

Treatment of articles in trunks and chests.—Articles in a trunk, chest, or wooden box, reasonably tight, can be protected perfectly during the summer by scattering between the folds of the clothing, preferably between sheets of thin clean paper, 1 pound of either flake naphthalene or paradichlorobenzene. Keep all covers tightly closed. Four ounces will give protection under ideal conditions. These chemicals are cheap; it pays to overdose and be safe.

Treatment of closet contents.—To control moths in a closet, brush thoroughly all clothing, clean the closet thoroughly, and seal all cracks in the plaster and about baseboards with crack fillers. Equip doorframes with rubber or felt gaskets against which the door can be shut tight at all points. Place on the top shelf, or hang in muslin bags from hooks, 1 pound of either flake naphthalene or paradichlorobenzene to each 100 cubic feet of closet space. The fumes given off by the slow evaporation of the crystals quickly stop moth larvae from feeding and ultimately kill them if the fumes are retained long enough in proper concentration. It is therefore important that the concentration of the fumes be maintained by making sure that the closet is perfectly tight and has a tight-fitting door that is kept closed except for brief periods when clothing is being put in or taken out. Set aside a closet to be used only for storage or, better yet, build a closet in the attic large enough to hold anything, including superfluous furniture, and keep it well stocked with flake naphthalene.

Paper bags.—Garment bags are of no value in themselves for killing moths, but if clothing free from moths is put into an unbroken garment bag that is tightly closed and sealed, the paper will keep moths out indefinitely. Once the moths get into the bags, either with the clothing or through breaks in the paper or at the fastenings, damage will result. The smell of cedar or pine oil in the bag will not prevent this. Printer's ink on newspaper has no protective value.

Cardboard closets.—Cardboard closets are of very doubtful value. Many are worthless. If very tight, they protect after the fashion of paper garment bags. The cedar or pine oil in these cardboard closets or boxes is of no practical use.

Cedar-lined closets.—Cedar-lined closets as ordinarily installed in the average home cannot be depended upon to protect clothing from moths.

Cedar chests.—Chests of red cedar (*Juniperus virginiana*) made of ¾-inch heartwood to the extent of 70 percent of the chest proper are dependable protectors of clothing from moth attack *provided they are tight and in good condition and the clothing is freed from all stages of clothes moths before it is placed in them.* Chests of neutral woods lined with a thin cedar veneer are not dependable. Cedar chests may be veneered on the outside with hardwoods, such as walnut or mahogany, without affecting their value as moth protectors.

Fabrics moths do not eat.—Moths do not eat cotton, linen, rayon, or other fabrics of vegetable fiber, or silk. Therefore drapes, furniture covers, and other articles made entirely of cotton, rayon, linen, or silk are not attacked. Moths will eat the woolen threads from woolen-cotton, woolen-rayon, or similar mixed-fiber fabrics, and in doing so may cut some of the vegetable fibers, just as they will eat a few small holes in cotton pillow covers if the feathers within become badly moth infested. Moths never cause injury in trunks or bureau drawers filled only with vegetable fabrics. In storing goods, pack together those things, like sheets, pillow cases, towels, and linen dresses, which need no protection from moths. Place woolens, furs, and animal products together in protected tight storage.

Emergency fumigation of trunks and closets.—Often the contents of trunks and closets that have been packed a long time and have had no moth protection are found to be "alive with insects." Do not scatter the infested pieces about the room, basement, or attic floor while determining the extent of the injury, because to do so would give the moth worms a chance to spread about. While flake naphthalene and paradichlorobenzene, mentioned above, are excellent for protection during storage, they do not kill rapidly. To kill all the moths in a trunk or closet quickly, fumigate for 12 to 24 hours with carbon disulphide, a liquid fumigant that may be purchased in tin cans at drug or seed stores. To fumigate, place on the top shelf of the closet, or on top of the garments in the trunk, a pie tin, saucer, or other shallow dish, and pour into it the amount of carbon disulphide needed. The liquid evaporates, forming a heavier-than-air, bad-smelling gas, which is explosive and inflammable in the presence of fire in any form. The gas, however, kills all moths. After pouring the liquid into the dish, quickly close the closet door and seal all the cracks about the door, including the keyhole. The door should be gasketed for best results. Trunks can be paper-lined if necessary. Keep lighted cigars, cigarettes, and fire in any form away during the fumigation period. Keep the windows in the room slightly open. The following dosages are effective and can be modified for closets of other sizes:

Closet, 3 by 8 by 8 feet	1½ pints.
Closet, 2 by 5 by 7 feet	¾ cup.
Closet, 4 by 5 by 7 feet	1½ cups.
Trunk, 21 by 20 by 42 inches	3 tablespoonfuls.
Box, 1 by 2 by 2 feet	1 tablespoonful.

The United States Department of Agriculture does not recommend the fumigation of large spaces, such as homes, with carbon disulphide because of the fire hazard, but for trunks and closets, where only a small quantity of gas is involved, fumigation can be conducted by anyone exercising ordinary caution. The ethylene dichloride-carbon tetrachloride mixture is used in the same way and, upon evaporation, produces a gas that is noninflammable and nonexplosive, and, therefore, free from the fire hazard. Unfortunately it is not so readily available at stores.

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